Claims:

1. A method for extracting third ventricle information from images of a plurality of axial slices of a third ventricle of a brain having an anterior commissure and a posterior commissure, the third ventricle having a third ventricle plane and a width, the method comprising:

(a) determining a third ventricle midline for each of a number of the axial slices;

(b) determining the orientation of each of the midlines;

(c) generating a histogram of the orientations of the midlines;

(d) determining the peak of the histogram to provide a peak orientation;

(e) selecting the midlines having an orientation within a predetermined angle from the peak orientation; and

(f) calculating the third ventricle plane from the midlines having an orientation within the predetermined angle from the peak orientation.

2. A method according to claim 1 wherein the step of calculating the third ventricle plane comprises calculating the least square fit plane of the midlines having an orientation within the predetermined angle from the peak orientation.

3. A method according to claim 2 wherein the step of calculating the third ventricle plane further comprises:

(i) calculating the maximum distance from the least square fit plane to the midlines having an orientation within the predetermined angle from the peak orientation,

(ii) generating a histogram of the maximum distance of the midlines having an orientation within the predetermined angle from the peak orientation to the least square fit plane,

(iii) determining the peak of the histogram of the maximum distance of the midlines to the least square fit plane,

(iv) selecting the midlines lying within a predetermined distance of the peak, and

(v) recalculating the least square fit plane using the selected midlines to generate the third ventricle plane.

4. A method according to any one of the preceding claims, further comprising calculating the width of the third ventricle.

5. A method according to claim 4, wherein the step of calculating the width of the third ventricle comprises determining the axial slice having the anterior commissure and the posterior commissure, determining two lines parallel to the third ventricle plane in said determined slice, said two lines being tangential to the image of the third ventricle in said slice to indicate the boundary between the third ventricle and grey matter, and calculating the distance between the two parallel lines, said distance being representative of the width of the third ventricle.

6. A method according to any one of the preceding claims, wherein the step of determining the third ventricle midline for each of a number of the axial slice s_i comprises calculating the local symmetry index of a searching line segment, the third ventricle midline being the searching line segment that has the minimum local symmetry index.

7. A method according to claim 6, wherein the local symmetry index $lsi(x,y,s_i, \theta)$ is calculated according to the following:

$$|ls(x,y,s_i,\theta)| \times lsi(x,y,s_i,\theta) = \sum_{(x_s,y_s)} \sum_{k} DifG(x_s, y_s, s_i, k)$$

where:

$|ls(x,y,s_i,\theta)|$ is the length of the searching line segment,

ls $(x,y,s_i\theta)$ is the searching line segment of voxel (x,y,s_i) with the searching angle θ, and (x,y,s_i) the searching point,

cos $(90° + \theta)$ is denoted as $c90\theta$,

sin $(90° + \theta)$ is denoted as $s90\theta$,

fabs $(g(x_s + k \times c90\theta, y_s + k \times s90\theta, s_i) - g(x_s - kxc90\theta, y_s - k \times s90\theta, s_i))$ is denoted as DifG (x_s, y_s, s_i,k), where fabs is the absolute value function, the contribution of voxel (x_s, y_s,s_i) to lsi (x, y, s_i,θ) being:

$DifG(x_s, y_s, s_i, k1) + DifG(x_s, y_s, s_i, k2) + DifG(x_s, y_s, s_i, k3) + DifG(x_s, y_s, s_i, k4) + DifG(x_s, y_s, s_i, k5)$, k1, k2, k3, k4, and k5 are constants.

8. A method according to claim 7, wherein k1 is around 0.5mm.

9. A method according to claim 7, wherein k2 is around 1mm.

10. A method according to claim 7, wherein k3 is around 3mm.

11. A method according to claim 7, wherein k4 is around 5mm.

12. A method according to claim 7, wherein k5 is around 7mm.

13. A method according to claim 5, wherein the step of determining the axial slice having the anterior commissure and the posterior commissure comprises:

(1) calculating the x co-ordinate of the voxel x_i for all of the axial slices where the third ventricle is present such that this voxel's y co-ordinate is the mass centre of s_i y_c, and (x_i, y_c, s_i) is on the third

ventricle plane, that is $x_i = -(d + c\ s_i + b\ y_c)/a$, where (a, b, c) is a unit normal vector and d is a non-positive constant;

(2) generating the searching line segment from (x_i, y_c, s_i) such that the line segment is on the third ventricle plane and its centre is (x_i y_c, s_i);

(3) calculating the average grey level avg_i of the searching line segment;

(4) comparing the average grey level avg_i for different axial slices s_i and determining the axial slice having the anterior commissure and the posterior commissure.

14. A method according to claim 13 wherein the step of determining the axial slice having the anterior commissure and the posterior commissure comprises for T1-, PD-weighted, FLAIR, and SPGR MR datasets, determining the axial slice with minimum average grey level avg_i.

15. A method according to claim 13 wherein the step of determining the axial slice having the anterior commissure and the posterior commissure comprises for T2-weighted MR datasets comprises determining the axial slice with maximum average grey level avg_i.16. An apparatus arranged to perform a method for extracting third ventricle information from images according to any one of the preceding claims.17. A computer program product comprising computer program instructions readable by a computer apparatus to cause the computer apparatus to perform a method according to any one of claims 1 to 15.